



**US Army Corps
of Engineers**

UPPER MISSISSIPPI RIVER SYSTEM FLOW FREQUENCY STUDY

(Upper Mississippi, Lower Missouri, & Illinois Rivers)

PUBLIC INVOLVEMENT NEWSLETTER

December 2000

This is the fourth Upper Mississippi River System Flow Frequency Study newsletter. The purpose of this newsletter is to continue to provide the public with updated information about the study's progress.

STUDY BACKGROUND

In October 1997, the U.S. Army Corps of Engineers, in partnership with State and Federal agencies, initiated a study to develop flow frequencies for the main-stem Upper Mississippi, Lower Missouri, and Illinois Rivers. Three groups were formed to assist with this study: the State and Federal agencies' Task Force, the Citizens' Public Involvement Group, and a Corps of Engineers-contracted Technical Advisory Group, whose members include a panel of nationally renowned scientists knowledgeable in flow frequency analysis.

By the end of the study, the Corps and partnering State and Federal agencies will select and apply the appropriate flow frequency analysis methods and analyze the effects of reductions in flood runoff attributable to flood control reservoirs, consider potential effects of levee overtopping and/or breaches, determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and develop these profiles.

The study map (in color), study newsletters, and minutes from the Task Force meeting and the Citizens' Public Involvement Group meeting can be viewed on the Corps of Engineers' web site at <http://www.mvr.usace.army.mil/>. Click on "Flow Frequency Study."

Those who do not have Internet access may request a copy of previous newsletters by writing to the address at the end of this newsletter.

What's Inside?

Study Experiences Delays	2
Study Progress Continues	2
Study Assumptions	2
Levee Issues	3
Citizens' P.I. Group Meets	4
Task Force Meets	5
Upcoming Meetings	6
New Project Manager Selected	6
Questions/Answers	6
Study Point of Contact	6



STUDY EXPERIENCES DELAYS

The UMRS Flow Frequency Study is dependent on creating digital terrain models for the flow frequency study area. Each of the five involved Corps of Engineers Districts (Omaha, St. Paul, Rock Island, St. Louis, and Kansas City) is currently working with a contractor to complete this task. **The digital terrain models (DTMs) are used to describe the geometry of the floodplain for the hydraulic models.**

The contractor is currently collecting additional ground control point data and 300+ miles of levee crest survey data to support quality control of the DTMs.

The Flow Frequency Study's original completion date was September 2001. As announced in the last study newsletter, the study's completion date was approved to be changed to March 2002. However, gathering digital terrain model data for the complex UNET unsteady flow model has required more time by the contractor than originally anticipated. It is anticipated that additional time may be required to obtain accurate data and complete the study.

The Corps welcomes the assistance of the States, local governments, and landowners in supplying recent and accurate floodplain and levee elevation data for use in performing quality control of the new floodplain digital elevation model data. Elevation data or a suggested person(s) to contact should be submitted to Ms. Heather Wiese at the Corps' Rock Island District (see Study Point of Contact, page 6).

STUDY PROGRESS CONTINUES

Meanwhile, the Upper Mississippi River System Flow Frequency Study is continuing in other areas. The study team is finalizing unregulated and regulated flow frequency analyses and report appendices, and developing water surface profiling and risk and uncertainty software. Omaha, Kansas City, and St. Louis Districts have received adequate data to proceed with UNET model development. **The UNET model is a one-dimensional numerical model that can represent the movement of floodwaters in a complex network of open channels. The UNET model can continuously stimulate many years of flow record, including the 1993 flood, at all locations along the Mississippi, Missouri and Illinois Rivers. The UNET model also simulates the effects of local levee breaks on river stages.**

STUDY ASSUMPTIONS

As stated on page 1 under "Study Background," by the end of the study the Task Force will determine and select the appropriate hydraulic model and relevant hydrologic and hydraulic data with which to develop water surface profiles for a range of flow frequencies, and will develop these profiles. To accomplish this, certain "assumptions" must be made by the study team that can be built into the model. Following is a summary of the hydrologic and hydraulic assumptions being made *to date*.

Hydrologic Assumptions. **Hydrology is a science dealing with the quantity and distribution of water.**

1. Period of Record - The period 1898-1998 was chosen because land use was relatively consistent, the period of record flows can be adequately adjusted for the effects of channelization by using hydraulic models, and this period of record is long enough to provide useful estimates of flood frequency.

2. Climate Change - The climate for the period of record, 1898-1998, is assumed to be stationary; i.e., not significantly changing. The analysis by the Corps of Engineers' Institute for Water Resources (IWR) showed possible trends for some stations but no clear climate change trend for this period. IWR's recommendation was to assume that the period of record was stationary given the difficulty in distinguishing a climatic trend from overall climatic variability. Consequently, standard flood frequency statistical analysis will be used to capture the overall variability in the flood record.

3. Unregulated Flow Frequency - The log-Pearson Type III analytical frequency distribution will be used for the unregulated (without dams) flow-frequency analysis. **Log Pearson Type III is the recommended method for flood flow frequency analysis used by all Federal agencies.**

Several new analytical distributions and parameter estimation methods were evaluated using the period of record. Significant differences between the application of the log-Pearson and other distributions were not found and hence it was decided to continue to use this standard distribution. The 'regional shape' factor, skew, is important and much analysis is going into determining appropriate values. The Technical Advisory Group recommended estimating the mean and standard deviation of the peak annual flow distribution from the gage record and interpolating these values with drainage area for locations on the main stem river between the

gages. The regional skew will be obtained by taking a best average estimate from gages situated in similar hydrologic and meteorologic conditions.

4. Regulated Flow Frequency - The regulated flow (with dams) frequency curve will be determined using a regulated vs. unregulated flow relationship (determined from UNET river-hydraulic flood routings or reservoir simulation models) and the unregulated frequency curve.

5. Regulated Stage Frequency - Risk and uncertainty will be evaluated in the frequency analysis per current Corps requirements.

Hydraulic Assumptions. Hydraulics, as related to this study, is the determination of water surface elevations.

1. Methodology - The table below shows the flood recurrence intervals and corresponding annual percent chance of exceedance that will be a published product of the UMRS Flow Frequency Study. In general, flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 2-, 5-, 10-, 50-, 100-, 200-, or 500-year period have been selected as having special significance for floodplain management. These events have a 50, 20, 10, 2, 1, 0.5, and 0.2-percent chance, respectively, of being equaled or exceeded during any year.

FLOOD EVENT	ANNUAL PERCENT CHANCE OF EXCEEDANCE
2-year flood	50%
5-year flood	20%
10-year flood	10%
50-year flood	2%
100-year flood	1%
200-year flood	0.5%
500-year flood	0.2%

The Flow Frequency Study will develop these profiles by rating final flow frequency values with UNET model generated single-valued discharge-stage rating curves.

2. Levee Impacts - Flow-frequency water surface profiles for the Flow Frequency Study are being computed based on system performance of the existing levee system. Computation of water surface profiles based on assumption of no Public Law (PL) 84-99 (Emergency Flood Control Act of 1955) levee overtopping is considered unrealistic by Corps Headquarters and several states. The consensus of the Flood Insurance Rate Map Subtask Force (the Corps of Engineers, Federal Emergency Management Agency (FEMA), and the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin) is that the final flood profiles should be based on existing conditions.

LEVEE ISSUES

The Corps of Engineers is responsible for administering the PL 84-99 Program. Under the current policy, PL 84-99 has no provisions for or against levee raises, for both Federal and non-Federal levees. All levee raises are the responsibility of the levee owners and must meet the State requirements. For non-PL 84-99 levees, the public law does not fund maintenance or improvements – including a levee raise. It is the sponsor's responsibility to raise the levee to meet the Federal minimum requirements in order for a levee to be admitted to the PL 84-99 Program, as long as the levee raise is in conformance with State criteria.

Under the current policy, PL 84-99 allows the Corps of Engineers to supplement a levee system owner's efforts to fight floods. This flood fighting support applies to both Federal and non-Federal levee systems enrolled in the PL 84-99 Program. Under the authority of PL 84-99, an eligible flood protective system can be rehabilitated if damaged by a significant flood event. The flood system would be restored to its pre-disaster status at no cost to the Federal system owner, and at 20% cost to the eligible non-Federal system owner. All systems considered eligible for PL 84-99 rehabilitation assistance should have met construction and maintenance criteria established for the program prior to the damaging flood event. The criteria are verified by levee system inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested Federal, State, and local agencies following any federally declared natural disaster event.

FEMA is the appropriate agency to address questions regarding the implementation of any changes to the Flood Insurance Program resulting from the Upper Mississippi River System Flow Frequency Study. The FEMA Regional Office VII in Kansas City has jurisdiction over the States of Nebraska, Kansas, Iowa, and Missouri. The FEMA Regional Office V in Chicago has jurisdiction over the States of Minnesota, Wisconsin, and Illinois.

Questions may be addressed to the following offices:

Federal Emergency Management Agency
Region VII
ATTN: Mr. Al Schulz
2323 Grand Boulevard, Suite 90
Kansas City, Missouri 64108

al.schulz@fema.gov

Federal Emergency Management Agency
Region V
ATTN: Mr. Ken Hinterlong
536 South Clark Street, 6th Floor
Chicago, IL 60605-1521

ken.hinterlong@fema.gov

CITIZENS' PUBLIC INVOLVEMENT GROUP MEETS

The Citizens' Public Involvement (P.I.) Group held its fifth meeting on June 28, 2000. Topics included at their meeting follow:

Mr. Paul Soyke, Rock Island District, Corps of Engineers, led the P.I. Group in a discussion on a proposed draft plan for upcoming public meetings. The purpose of the public meetings will be to explain the reason for and the results of the Flow Frequency Study to the general public. The goal of the meetings will be to try to assure that the public understands the results and how they may be directly impacted by any changes. This will be accomplished by using an open house format that would offer the public one-on-one conversations with the study team, displays for viewing, and a formal presentation with a question and answer session. The meetings will be held along the Mississippi, Missouri, and Illinois Rivers in several communities throughout the study area. The P.I. Group members are concerned that the appropriate locations are selected and that an adequate number of meetings are held.

Mr. S. K. Nanda, Chairman of the Task Force, explained that if a Federal or PL 84-99 levee is damaged or breached during a flood event, the Corps may rebuild it to its authorized elevation. Each levee district is responsible for its own upgrades and the levees must meet State permitting requirements. (See the discussion on page 3 under **Levee Issues**.)

Mr. Joe McCormick, Corps of Engineers, Mississippi Valley Division, and Mr. Arlen Feldman, Corps of Engineers' Hydrologic Engineering Center (HEC), discussed the difference between a Standard Project Flood and a Project Design Flood. The Mississippi River and Tributaries (MR&T) Project provides protection to the lower Mississippi River Valley from a flood referred to as a Project Design Flood (PDF). The development of the design discharges for that flood is consistent with the procedure used to develop discharges for Standard Project Floods (SPF) for other areas. Therefore, the PDF is on the order of magnitude of an SPF even though it is not referred to as an SPF. The SPF is defined as a flood producing "discharges that may be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the geographical region involved, excluding extremely rare combinations." In other words, the SPF is a very large flood, but not the largest flood possible.

The PDF was selected for the lower Mississippi River after investigating 35 different Hypothetical Storm Series developed for the Mississippi River Commission by the National Weather Service. The one selected for the design of the MR&T Project was chosen because, of all the floods investigated, it produced the largest discharges from Cairo to the Gulf of Mexico. Thus, neither the SPF nor the PDF are based on a frequency flood technique, but rather on a procedure that determines the discharges that could be produced by very large flood events. Therefore, there is not a specific frequency that can be associated with either the SPF or the PDF.

Once finalized, the June 28, 2000, Citizens' Public Involvement Group meeting minutes will be available for viewing on the Corps' Flow Frequency Study's web site at the address shown on the first page of this newsletter.

New P.I. Group Chairperson Announced

Mr. Paul Soyke, Chairman of the Citizens' Public Involvement Group since the beginning of the Flow Frequency Study, is retiring from Federal service on December 2, 2000. Mr. Soyke's replacement will be Ms. Laura Abney, also from the Corps of Engineers' Rock Island District. Ms. Abney, an agricultural economist who came to the Corps of Engineers in November 1999 with 16+ years experience with the U.S. Department of Agriculture (USDA), has facilitation and training skills.

TASK FORCE MEETS

The Task Force met on June 29, 2000, in St. Louis, Missouri. A brief summary of the meeting follows. A complete summary of this meeting is available on the Internet at the address listed on the first page of this newsletter. The transcript, which includes a list of the meeting attendees, is available upon request from the Rock Island District, Corps of Engineers.

Agencies/groups that were represented at the meeting were: Corps of Engineers, Federal Emergency Management Agency; U.S. Geological Survey; Bureau of Reclamation; States of Illinois, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin; Upper Mississippi River Basin Association; and the Citizens' Public Involvement Group.

Dr. David Goldman, Corps of Engineers' Hydrologic Engineering Center (HEC), provided a summary of the essentially final selected methodology for developing the required frequency relationships. The principal remaining work on the hydrology has to do with completing the Illinois River, which may be affected by backwater. Additional work also remains on the Mississippi and Missouri Rivers below St. Charles and Alton to St. Louis. This reach is complicated by high Missouri River flows that can cross the Missouri and Mississippi delta and flow directly into the Mississippi River.

Dr. Goldman described in general terms the process of developing stage profiles for the Upper Mississippi based on the unsteady flow modeling techniques. The process includes combining the flow frequency curve for unregulated conditions with a curve that depicts the regulated and unregulated relationship. The regulated flow versus probability curve is obtained from this process for each point location or station along the river. Next, a rating curve for each point is developed using

UNET. The stage frequency at each point or river station, or the profile for a given probability flow, can then be obtained from the station rating curves and the regulated frequency curves. HEC has been contracted to develop software to accomplish most of this process automatically as well as address the uncertainty aspects of the process.

Mr. Earl Eiker, from the Corps of Engineers Headquarters in Washington, D.C., spoke about the necessity to evaluate risk and uncertainty in the study. Risk and uncertainty are intrinsic in water resource planning and design. For hydrologic and hydraulic analysis, the principal variables are discharge and stage. Uncertainty in discharge exists because record lengths are often short or do not exist where needed, precipitation-runoff computation methods are inaccurate, and the effects of flood flow regulation measurements are not precisely known. Uncertainty factors that affect stage might include conveyance roughness, cross-section geometry, sediment transport, flow regime, and bed form.

Mr. S. K. Nanda, Chairman of the Task Force, stated that the inundation mapping aspect has been removed from the study and will be accomplished later under agreements with FEMA.

Mr. Rolf Olsen, Corps of Engineers' Water Resources Support Center (WRC), provided an update on the investigation of impacts of climate variability and land use changes on flow frequency. He demonstrated some clear trends in temperature and rainfall. However, though most forecasts agree that temperature will probably continue to increase in our study area, the amount and impacts are not certain. He clearly identified impacts of land use on runoff and showed that major changes in land use occurred prior to 1900. This supports the decision to not include in the flow frequency analysis the flow records prior to 1900. In general, there is a great deal of uncertainty in the prediction and use of trends in both climate and land use.

Mr. Dennis Hamilton, Rock Island District, Corps of Engineers, and Mr. Bill Blanton, FEMA, Washington, D.C., provided a brief update to the Task Force regarding using the results of the flow frequency study to update FEMA flood insurance rate maps (FIRMs). Work is in progress to develop a Memorandum of Understanding (MOU) between the Corps of Engineers and FEMA to accomplish the FIRM updates.

The Task Force discussed the assumed levee heights for failure analysis. Mr. Eiker indicated that the no overtopping assumption is not considered appropriate by the Corps of Engineers. In general, the States would not support an assumption that the levees would never be overtopped.

Meeting participants and Federal and State representatives expressed support for the study and appreciation for their involvement. They also expressed support for use of the Bulletin 17B approach and using data pertaining to years after 1900 only.

Mr. Nanda ended the meeting by encouraging the drainage districts to check Digital Terrain Model data and encouraging the States to develop a joint view of how to determine the floodway and address the levee assumptions.

UPCOMING MEETINGS

The next Citizens' Public Involvement Group meeting and Task Force meeting are anticipated to be held in summer 2001.

NEW PROJECT MANAGER SELECTED

Mr. Jerry Skalak, Rock Island District, Corps of Engineers, has been appointed as the new Project Manager for the Flow Frequency Study. Mr. Skalak is a Wisconsin native who began his Government service career with the Defense Mapping Agency in San Antonio, Texas. He came to Rock Island District in 1988. In 1995, he received his Master's degree in Water Resources Management from the University of Wisconsin - Madison. Mr. Skalak has played multiple roles in the management of the District's Environmental Management Program (EMP) activities, most recently serving as project manager for the Long Term Resources Management element of that program. In March 2000, Mr. Skalak assumed regional project manager responsibilities for both the Upper Mississippi River System Flow Frequency Study and the Comprehensive Plan. He also heads up the District's Floodplain Management Services and Planning Assistance to States Programs. Mr. Skalak may be contacted by telephone at (309) 794-5605. He also may be reached by email at Jerry.A.Skalak@usace.army.mil.

QUESTIONS/ANSWERS

The Flow Frequency Study team has tried to inform the public of study progress through the study newsletters; however, there are many unanswered questions about the study. In the next few months the Flow Frequency Study team plans to release a "Special Edition" newsletter to address Frequently Asked Questions (FAQs) with the hope of increasing the public's understanding of this study. If you have a question that you would like to see addressed in our FAQ Edition, please submit them to Ms. Heather Wiese at the address on this page. Although we cannot promise that every question submitted will be answered in print, we will make every effort to answer those that are asked repeatedly. The following questions are examples of FAQs.

Q. Do navigation dams control flooding?

A. No, because navigation dams release all incoming flows and have negligible storage capacity.

Q. What flood data are used in the flow frequency analysis? Can there be more than one flood peak per year?

A. This study will be using annual series analysis which utilizes the highest flow per year at each river gage site.

STUDY POINT OF CONTACT

Ms. Heather Wiese, Rock Island District, Corps of Engineers, has replaced Mr. George Gitter as the Flow Frequency Study point of contact. Ms. Wiese joins the study with a background in civil engineering.

For further information or questions about the Flow Frequency Study, or if you have comments about the study, please contact Ms. Wiese by telephone at (309) 794-5387, fax (309) 794-5710, or email: Heather.L.Wiese@usace.army.mil. If you prefer, you may write to Ms. Wiese at the following address:

U.S. Army Engineer District, Rock Island
ATTN: CEMVR-PM-M (Wiese)
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

If you are aware of others who should be informed of this study and who may want to be added to our mailing list, please ask them to contact Ms. Wiese.

We welcome your input.